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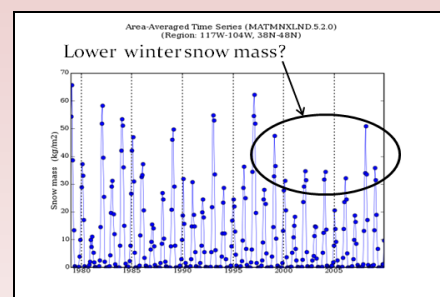
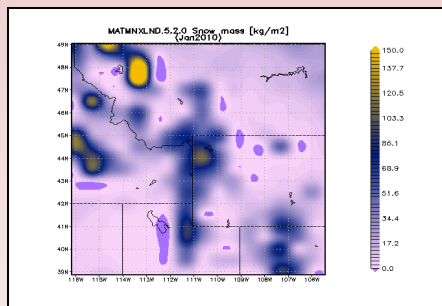
The name "Giovanni" was not inspired by a person, but Italian explorer Giovanni da Verrazzano would work. There are three bridges named after Giovanni da Verrazzano: the Verrazano Narrows Bridge connecting Staten Island and Brooklyn; the Jamestown Verrazzano Bridge over Narragansett Bay, and Maryland's Verrazzano Bridge to Assateague Island. He explored both New York Harbor and Narragansett Bay.

*Our Giovanni is the bridge
between data and science.*

GES DISC presentations at GISS

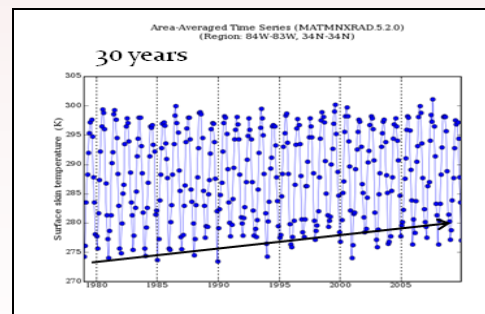
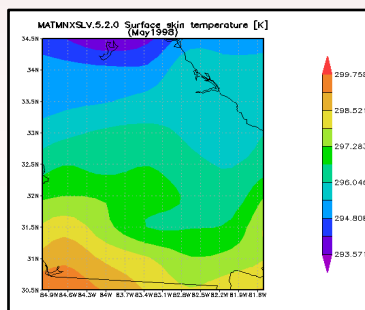
On September 23rd, GES DISC scientists James Acker (Wyle IS LLC) and Ana Prados (University of Maryland - Baltimore County/Joint Center for Earth Systems Technology) gave a joint presentation at the Goddard Institute for Space Studies (GISS) in New York City. Dr. Acker's presentation was entitled **"Using Giovanni to Look Back (and Forward?) at Global and Regional Climate,"** and the presentation given by Dr. Prados was entitled **"NASA Applied Remote Sensing Education and Training Activities."**

Dr. Acker briefly described the Giovanni system, and noted that most of the data sets in Giovanni are from the "EOS era," beginning in the mid-1990s and continuing to present. The short duration of these data sets makes it difficult to distinguish climate trends from natural variability. The addition of Modern Era Retrospective-Analysis for Research and Applications (MERRA) data to Giovanni provides a decades-long data set commencing in 1979. This period of time is long enough to discern trends related to climate change. Dr. Acker provided several examples of possible climate trends visualized from MERRA data with Giovanni (as illustrated by the figures from the presentation shown below). Dr. Acker then discussed the advantages of adding climate model output data to Giovanni, to provide a perspective on the future of Earth's climate, in addition to historical visualizations that can be created with Giovanni.



Snow mass in the U.S. Rocky Mountain states, January 2010 (left), and average snow mass for this region, 1979-2010 (right), plotted with MERRA Giovanni.

There is an indication of slightly decreased winter snow mass after the mid-1990s, consistent with western regional drought and higher surface temperatures.



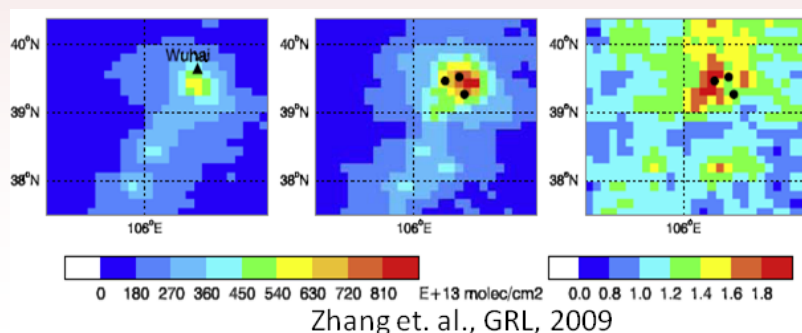
Surface Skin Temperature for Georgia (USA), July 1998 (left), and monthly Surface Skin Temperature for the Lake Lanier region near Atlanta, January 1979 – December 2009 (right), plotted with MERRA Giovanni. The full 30-year length of the MERRA period indicates a trend of increasing winter surface temperatures, but little change in summer temperatures.

GES DISC Presentations at GISS (continued from previous page)

Dr. Prados and colleagues have provided several professional training workshops focused on air quality, utilizing NASA data acquired by missions and instruments such as the Moderate Resolution Imaging Spectroradiometer (MODIS), the Ozone Measuring Instrument (OMI), and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO). The workshops also present the use of various NASA tools, including Giovanni to visualize the data. The presentations created for this activity are found at the ARSET Web site, <http://arset.gsfc.nasa.gov>.

The program thus far has trained a broad spectrum of persons concerned with air quality, including managers and planners, forecasters, modelers, health scientists and technical professionals, researchers, and students with a wide range of expertise in satellite remote sensing applications. Each workshop includes guided hands-on activities and Case Studies with step-by-step instructions for using NASA satellite data products to analyze the types of air pollution events a decision-maker could encounter.

Dr. Prados showed several different images of air quality scenarios in her presentation. These scenarios included smoke from wildfires, transport of pollution haze, comparisons of satellite data to EPA data from surface monitoring stations, and multi-data product analyses of single events, which helps discern the sources and impacts of such events. Dr. Prados emphasized that the availability of NASA data with NASA tools to visualize the data expands the use of these data well beyond the research science community. As shown below, one slide from her presentation was of particular interest, demonstrating how NO₂ data indicate increasing emissions from coal-burning power plants in China.



Increasing concentration of satellite-measured NO₂ from new coal-fired power plants (black dots) near Wuhai, China. **Right:** Avg. NO₂ concentration in summer 2005. **Center:** Avg. NO₂ concentration in summer 2007. **Left:** Ratio of summer 2007 to summer 2005.

Source: Zhang et al. (2009) Satellite observations of recent power plant construction in Inner Mongolia, China. *GRL*, 36, L15809, doi:10.1029/2009GL038984

More followers (and more fun!) on Twitter

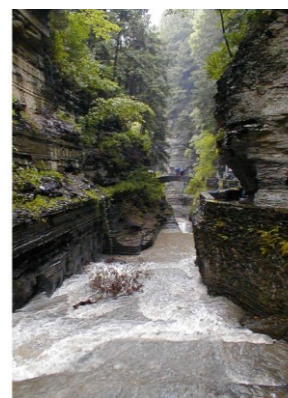
According to a recent presentation on social media given at Goddard Space Flight Center, 95% of Twitter accounts have less than 100 followers. We are slowly approaching that statistical milestone for our [nasa_gesdisc](#) Twitter feed; [nasa_giovanni](#) has somewhat less. As we learn more about how to use Twitter, and how our tweets are being distributed and received, we expect (and hope) that our following throng will continue to grow. So all of our readers are invited to follow us (if you have a Twitter account) or sign up for a Twitter account and then follow us. If you're an active Twitter user, send us a message about what you'd like us to tweet about!

(Jim Acker has a personal Twitter feed, [got_giovanni](#), which has tweets about environment, climate, ocean, and various science topics.)

follow us on
twitter

ESSEA annual meeting enhances educational module collaboration

On August 9-12, 2010, the Earth System Science Educational Alliance (ESSEA) met for their annual conference, hosted in Ithaca, NY by the Museum of the Earth. ESSEA is part of the Institute for Global Environmental Strategies (IGES). The main activity of ESSEA is the creation of educational modules designed to instruct teachers on a wide variety of earth science topics, enabling them to incorporate knowledge derived from the modules into the classroom. ESSEA is funded by NASA, the National Oceanic and Atmospheric Administration (NOAA), and the National Science Foundation (NSF). The NASA GES DISC was contacted to demonstrate how Giovanni could be utilized for development of climate change educational modules that are funded by NASA. Module developers were shown how to access data in Giovanni, types of data that would be relevant and informative, and in particular how Atmospheric Infrared Sounder (AIRS) data could be used to examine carbon dioxide (CO₂), temperature, and water vapor trends in Earth's atmosphere. The module developers were enthusiastic about Giovanni, and GES DISC staff perceived ways that the Giovanni Web site could be improved to facilitate Giovanni use by both teachers and students.



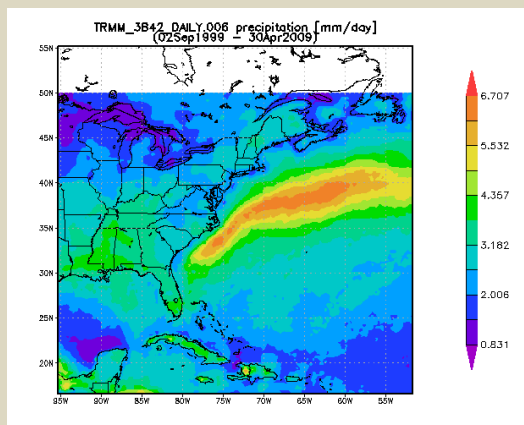
Enfield Glen, Ithaca, NY,
one day after Hurricane
Floyd, 09/16/1999

In the classroom: visualizing tropical storm tracks

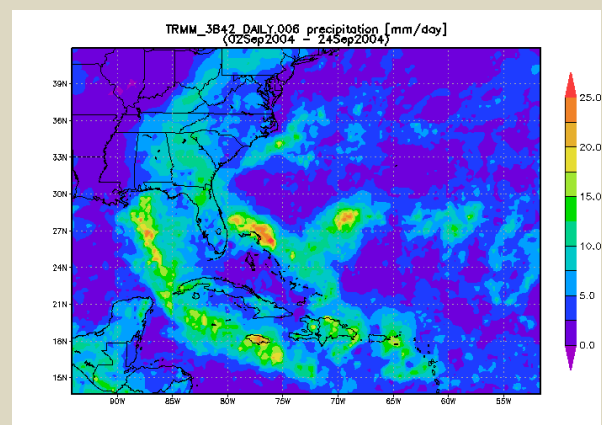
One of the easiest things teachers and students can do with Giovanni is to plot the rainfall tracks of tropical weather systems (tropical storms, hurricanes, and cyclones). Rainfall is an inherently easy data product to understand; the higher the value of the data product (be it millimeters or inches), the more rain that fell in a particular area. The heavy volumes of rainfall that normally accompany tropical systems will generally dominate the time period that was affected by the system, so the track is usually easy to discern.

Plotting tropical weather system rainfall tracks can provide several lessons in the classroom. One, it emphasizes when such storms occur for particular regions: obviously the seasonality is more pronounced for the tropical Atlantic than for the tropical Pacific. Two, it shows where the storms originated and how far their influence extended. Three, it can also show that many storms don't make landfall, but their evaporative and precipitation effects are important climate factors. Four, tracks could be correlated with sea surface temperatures (SSTs) to show the influence of SST on storm intensity, and even to demonstrate that tropical weather systems don't initiate when SST is below a critical temperature threshold. The influence of tropical weather systems on regional hydrology can also be discussed; studies show that tropical weather systems are important water sources over the southeastern U.S. during late summer and fall, which would otherwise be a fairly dry period. Of course, the downside of such storms can be dangerous and catastrophic flooding.

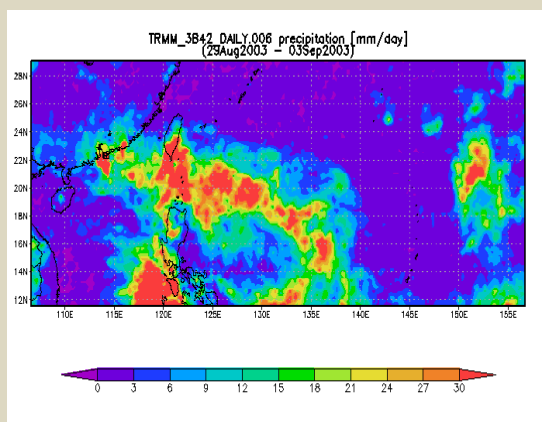
Below are rainfall tracks for four tropical weather systems. The *Daily TRMM and other Rainfall Estimate (3B42 V6 derived)* Giovanni interface was used to generate these storm tracks.



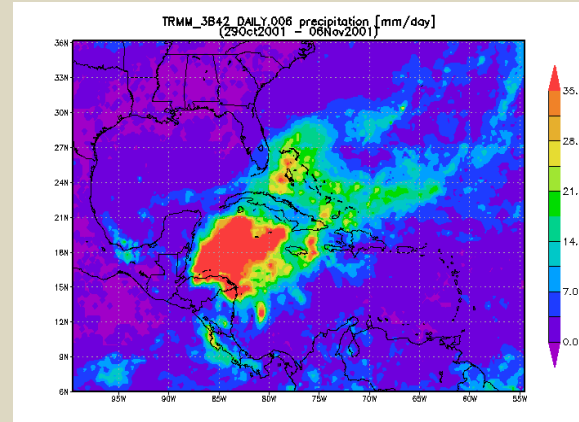
Hurricane Floyd, September 21-30, 1999: Floyd followed along the U.S. East Coast, providing sufficient rainfall to help alleviate drought conditions in several states.



Hurricane Ivan, September 2-24, 2004: "Crazy" Ivan pummeled Jamaica and the Cayman Islands, then hit the Florida Panhandle. The system turned into the Atlantic, swung around and went over Florida again.



Typhoon Dujuan, August 29-September 3, 2003: Dujuan battered southern Taiwan, then made a direct line over Hong Kong, the city's strongest typhoon in a quarter-century.



Hurricane Michelle, October 29-November 6, 2001: Touristy Michelle spent idle days in the western Caribbean before finally heading northeast over western Cuba and the northern Bahamas.

Featured Giovanni interface: OMI (and OMI L2G)

OMI is not shorthand in a text message; OMI stands for *Ozone Monitoring Instrument*, which continues the data record that commenced with the Nimbus 7 Total Ozone Mapping Spectrometer (TOMS) and continued with its successors, Earth Probe TOMS and Meteor-3 TOMS. OMI is an instrument on the Earth Observing System Aura satellite, which was launched on July 15, 2004. The OMI data record commences on October 1, 2004, and continues to the present. Ever since the discovery of stratospheric ozone depletion and the related reductions in stratospheric ozone concentration over Antarctica in austral spring (referred to colloquially as the “ozone hole”), maintaining a continuous record of stratospheric ozone concentrations has been a top priority for NASA’s earth observing science. OMI, however, does much more than that.

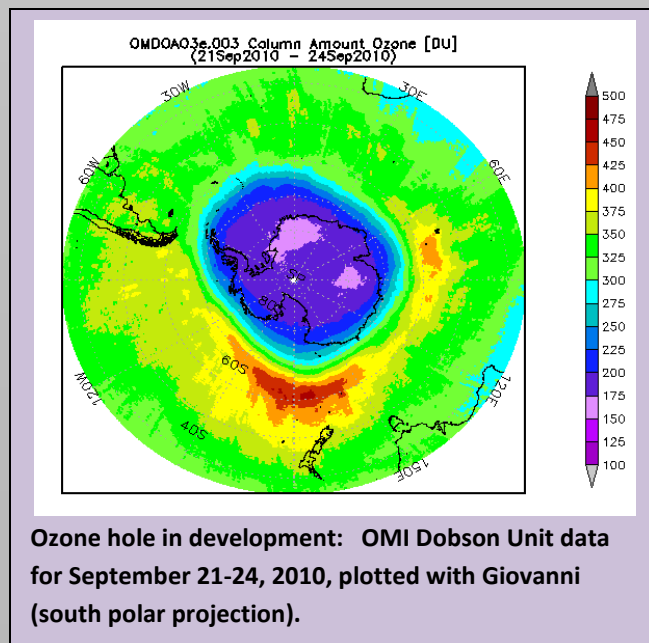
OMI is an international collaboration: the instrument is a contribution of the Netherlands' Agency for Aerospace Programs (NIVR), in collaboration with the Finnish Meteorological Institute (FMI) to the Aura mission. The OMI Web site is at the Koninklijk Nederlands Meteorologisch Instituut (KNMI), <http://www.knmi.nl/omi/>.

Giovanni has two OMI interfaces: *Aura OMI L3* and *Aura OMI L2G*. ‘**L3**’ refers to Level 3 data, which are spatially averaged data mapped to a global grid. ‘**L2G**’ represents Level 2 Gridded data; for these data, all of the information from the original high-resolution Level 2 data for a single day are collected (“binned”) into 0.25° grid cells (except for the OMI sulfur dioxide (SO₂) data product, which is binned at 0.125°). OMI L2G is currently the only L2G data product interface in Giovanni, though others have been considered.

The two interfaces do not have identical data; as noted directly above, OMI L2G has an SO₂ data product and several meteorological data products, such as cloud fraction and cloud pressure. In contrast, OMI L3 offers a ‘basic’ ozone data product suite, where likely the most familiar is Total Column Ozone in Dobson Units (DU). OMI L3 also has atmospheric optical data products, such as Aerosol Optical Depth, Aerosol Absorption and Extinction Optical Depths, as well as data products related to solar ultraviolet (UV) radiation, including UVB Erythmal Daily Dose and UVB Irradiance at several wavelengths. Both interfaces include nitrogen dioxide (NO₂) data products.

If anyone wonders what *erythmal* means, it is a “reddening of the skin” – which usually equates to sunburn. The need for OMI and its predecessor satellite instruments was driven by the recognition that chemical species entering the atmosphere, primarily chlorofluorocarbons (CFCs), were gradually destroying the protective ozone that resides in Earth’s stratosphere.

OMI data are used for more than UV monitoring or planning how much sun time to get at the beach; the data are also integral to monitoring air quality and air pollution around the world. OMI NO₂ data indicate sources and transport of smoke from fires and soot from power plants. SO₂ data show the transport of volcanic aerosols from powerful eruptions. OMI data are also used in climate research, relating stratospheric ozone to stratospheric temperatures, upper atmosphere wind speeds, and Earth’s overall radiation balance. OMI data are therefore vital for understanding Earth’s climate and humankind’s influence on it.



Giovanni: simplified analyses = expanded knowledge
<http://giovanni.gsfc.nasa.gov>

2010 Giovanni publication count update

At the beginning of October – with three months left in the calendar year – 91 journal papers had been published in 2010 in which Giovanni imagery and/or data analyses appear. **This number exceeds the full count of peer-reviewed publications in 2009**, emphasizing a continuing annual increase in the number of publications where Giovanni has been utilized. Three of the papers still have to be added to the list on the Web site; two of these are 'in press' for the *Journal of Applied Meteorology and Climatology*, and the other is the *Geophysical Research Letters* paper on the ocean biological effects of the eruption of the Aleutian volcano Kasatochi discussed below. (The last one was found via Twitter!)

Giovanni visualizations are increasingly being found in scientific books; the list of new publications includes a chapter in the book *A Little Less Arctic*, about the environment of Canada's Hudson Bay, and the book *Air Pollution Modeling and its Application XX*, NATO Science for Peace and Security Series C: *Environmental Security*. Perhaps the most intriguing paper in this set is by Singh et al. in the *International Journal of Remote Sensing*, "Precursory signals using satellite and ground data associated with the Wenchuan Earthquake of 12 May 2008."

The eruption of Kasatochi: Giovanni used in research observing effects on phytoplankton and marine birds

On August 7-8, 2008, a small island volcano in the Aleutian chain named Kasatochi transformed from a quiet rookery for auklets and gulls into a catastrophic reminder of the unpredictability and power of Earth's geologic forces. Massive explosions sent ash and sulfur dioxide (SO₂) more than 13 km into the atmosphere, creating an SO₂ cloud that spread widely over the Northern Hemisphere, and casting a huge volume of ash onto the waters of the Pacific Ocean and Bering Sea. The eruption ended almost as abruptly as it started, thankfully sparing the lives of two marine bird observers who evacuated the island minutes before the catastrophic stage of the eruption began.

As this eruption occurred during the height of the summer research season (winter research here being a *much less* desirable option), research cruise ships happened to be in the region, and they investigated the effects of the eruption on the biology of the ocean. What they discovered was remarkable. It had been long suspected that volcanic ash could provide iron, an essential nutrient to phytoplankton, and foster a bloom. This expectation was partly due to the persistently high phytoplankton productivity near the Galapagos Islands, which is sustained by iron derived from undersea volcanic sediments. However, a bloom triggered by ash deposition from a volcanic eruption had never been observed before. The voluminous ash dispersed over the ocean from Kasatochi spurred just such an explosion of phytoplankton growth (Hamme et al., 2010). This paper included Giovanni-generated images of chlorophyll *a* concentration.

Meanwhile and also subsequent to the eruption, field ornithologists observed the effects of this eruption on marine bird populations; despite the plankton bloom observed immediately after the eruption, there was no effect on ocean nutrients the following summer. Phytoplankton distributions were again examined via Giovanni for this paper. The island's loyal population of auklets returned in largely unaffected numbers, attempting to breed on the highly-altered island (Drew et al., 2010). They were largely unsuccessful, because all the available nesting areas had been destroyed. Whether this problem will eventually diminish the strong affinity in their bird-brains for their accustomed rookery location is not known.

REFERENCES:

- Drew et al. (2010) At-sea observations of marine birds and their habitats before and after the 2008 eruption of Kasatochi Volcano, Alaska. *Arctic, Antarctic, and Alpine Research*, **42** (3), 325–334.
- Hamme et al. (2010) Volcanic ash fuels anomalous plankton bloom in subarctic northeast Pacific. *Geophysical Research Letters*, **37**, L19604, doi:10.1029/2010GL04469

